O_3,SO_2,NO_2 and UVB MEASUREMENTS IN BEIJING AND BASELINE STATION OF NORTHWESTERN PART OF CHINA

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ABSTRACT:

A MKII Brewer Ozone Spectrometer was used in Beijing from Oct.1990 to June 1991 to take the measurement of O_3,SO_2 and UVB radiation.And since Nov. 1991 a new MKIV Brewer Spectrometer, which can take the measurements of O_3,SO_2,NO_2 and UVB radiation, has been set up in Beijing. The MKII Brewer Spectrometer was moved to Qinghai baseline station which is on the Qinghai -tibetean plateau in the northwestern part of China. Both the data in Beijing and Qinghai baseline station has been analysed and some results will be shown here.And also the ozone profiles have been got through the Umkehr program given by AES of Canada for the Brewer Ozone Spectrometer.

INTRODUCTION:

Nowadays,the decrease of ozone and increase of greenhouse gases are two important respects of Atmospheric Chemistry Research Work. Therefore, monitoring the atmospheric constituents, finding its influence, investing the causes for their change are the task for the scientific society and goverment all over the world.With the help of WMO,our goverment has decided to build up a baseline station on Qinghai- Tibetean Plateau, which is in the northwestern part of China.It is said to be WMO's first inland baseline station of high altitude in mid- latitude region. Its altitude is 3816m. Our Brewer Spectrometer has been calibrated twice with the WMO travelling standard Brewer #017 in the passed year.

MEASUREMENT RESULTS IN QINGHAI BASELINE STATION:

At the present time,the construction work of our baseline station has not been finished yet, so our Brewer Spectrometer is located in Gonghe county just close to our baseline station. The latitude and longitude of the place where our Brewer Spectrometer located is 36.267 and - 100 .617 respectly and the altitude is about 3km. For one year period (Sep. 1991--Aug. 1992), most of days we can get good results of total column of O 3,SO_2 and UVB radiation value and more than 150 days of the year,through the Umkehr program, we can get good ozone profile results (RMSRES< 0. 7 Iter<3) and a lot of days we can get two ozone profiles both for AM and PM.So we can say the weather condition there is quiet good for atmospheric background monitoring. Through the measurement results in Qinghai baseline station we can see:

1.The seasonal variation of total column amount of ozone is similar to other station's result, higher in Winter and Spring and lower in Summer and Autumn. The noon time UVB radiation value is somewhat inverse to the ozone amount.(see fig. 1 and fig. 2)

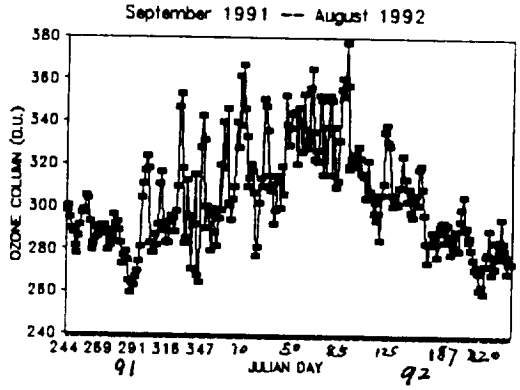

Fig. 1 The column amount of ozone in Qinghai baseline station

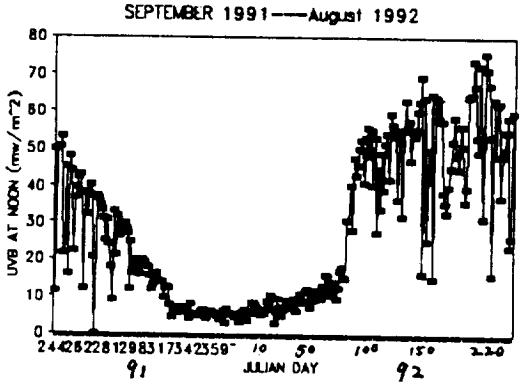

Fig. 2 The UVB(280-325 nm) value at noon in Qinghai baseline station

2.Most of days SO_2 column amount is near zero except the few high value days of using stove for heating.(see fig. 3)

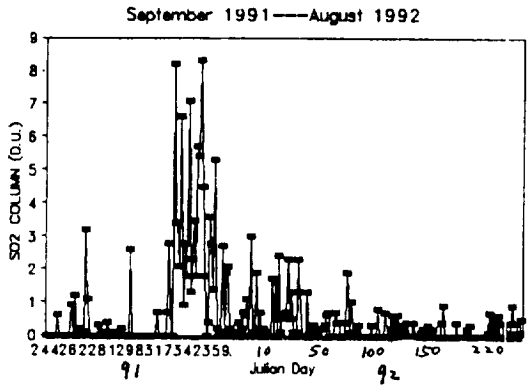

Fig. 3 The column amount of SO_2 in Qinghai baseline station

3.Through the ozone profiles measured by Brewer Spectrometer and processed by Umkehr program developed by AES of Canada, we can see the seasonal variation of stratosphere layer ozone. For the 19.13-23.59km and 14.71- 19. 13km layer, the ozone value has a seasonal variation somewhat like the total column amount of ozone and for the 23.59-28.14km, 28.14- 32. 79km layer the variation is smaller and the rest two layers has even smaller variation.(see fig. 4)

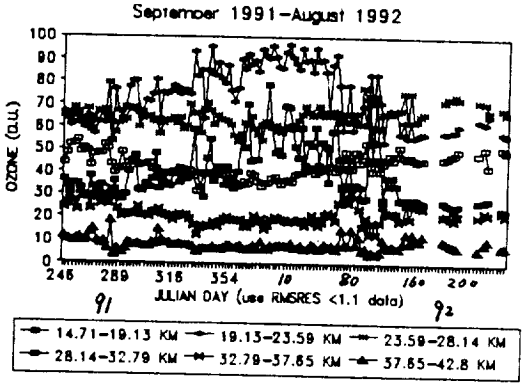

Fig. 4 The stratophere layer ozone results from Umkehr method in Qinghai baseline station

MEASUREMENT RESULTS IN BEIJING:

We have compared the total column amount of ozone measured by Brewer in city Beijing(lat.=39.95,long.=-116.317) with that measured by Dobson Spectrometer in Xianghe Station(lat.=39.46,long.=-117.00) which is in the suburb of Beijing. Through the eight months comparison (see fig. 5), we can see that most of days the daily means is quiet close. Among the total 135 days,84 days is less than 1%, another 35 days is less than 2%,the other 24 days is less than 3% while the rest 14 days is more than 3%.

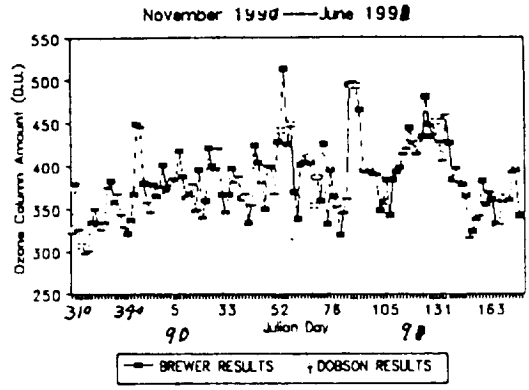

Fig. 5 The column amount of ozone by Brewer and Dobson in Beijing

Through the Oct. 1990-June 1991 and Nov. 1991-May 1992 data (see fig.6,7,8,9),we can conclude:
1.Ozone has a more complicated relationship to UVB radiation value probably because of more aerosol in Beijing.
2.SO_2 amount is quiet high in city Beijing in the heating season.
3.It is interesting to note that as the strong wind happened in Beijing the O_3 amount increased sharply while the SO_2 amount decreased heavely. The increased amount of ozone is because of the transfer of high latitude ozone and decreased amount of SO_2 is because the wind made the air clear.

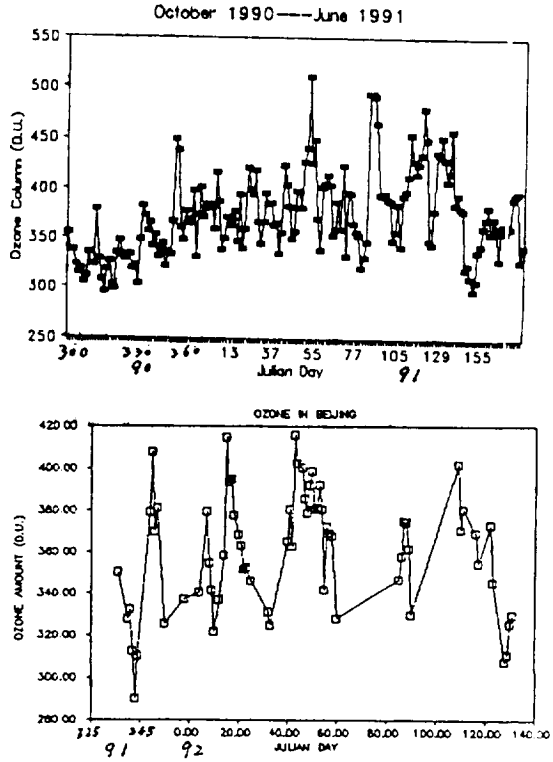

Fig. 6 The column amount of ozone in city Beijing

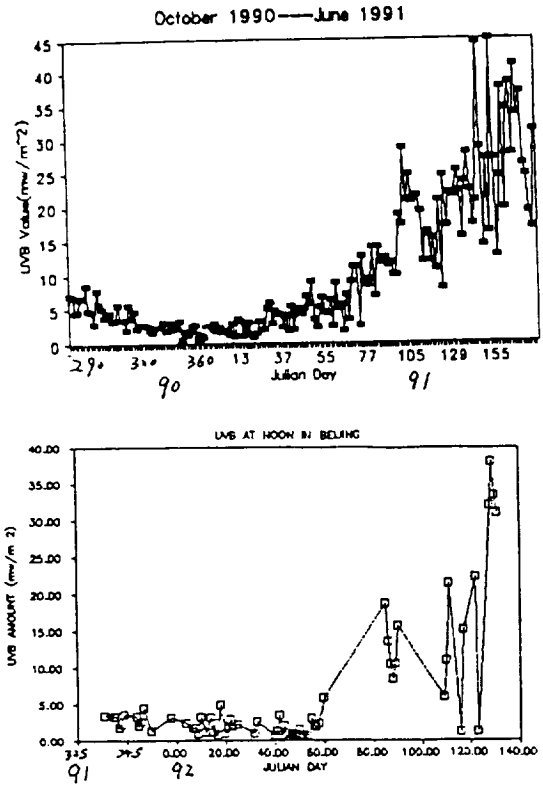

Fig. 7 The UVB(290-325 nm) value at noon in city Beijing

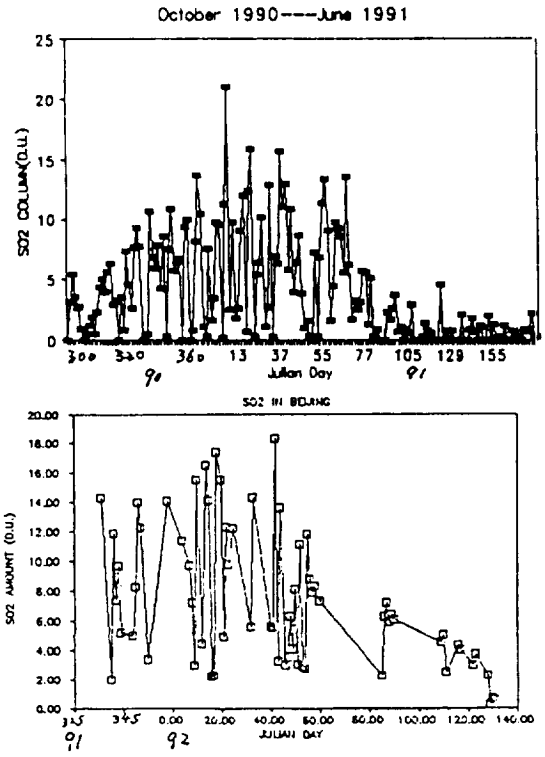

Fig. 8 The column amount of SO_2 in city Beijing

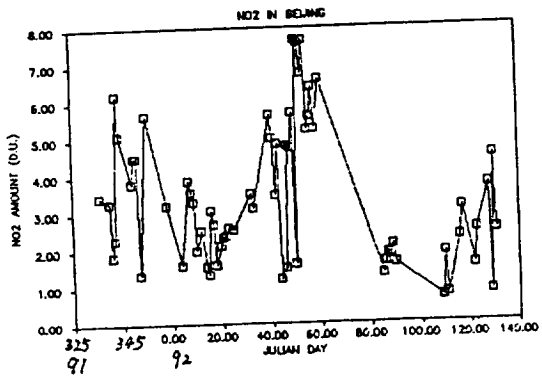

Fig. 9 The column amount of NO_2 in city Beijing

COMPARISON OF MEASUREMENT RESULTS IN QINGHAI BASELINE STATION AND CITY BEIJING:

1.The two station's latitude is quiet close (Beijing 39.95,Gonghe 38.267),but the ozone value has great difference.General speaking,the daily means of total column amount of ozone in Qingahi is about 30- 60 D.U.lower than that of Beijing in the same day. Compared with world's other ozone station which latitude is close to Qinghai baseline station,we find that the daily means of ozone in Qingahi is also about 30-60 D.U. lower. The reason is probably because of the special meterological condition in Qinghai- Tibetean plateau.For detail reason it is under research now.

2.SO_2 amount in Beijing is greatly higher than that in Qinghai baseline station.

3.By auto-spectrum analysis,the O_3 amount shows a 14 days period trend in Beijing while it shows a 16 days period trend in Qinghai.

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